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Characterizing the initial conditions of heavy-ion collisions with correlations between mean transverse momentum and anisotropic flow

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The study of the initial conditions of relativistic heavy-ion collisions and the subsequent development of hot and dense nuclear matter at the LHC is fundamental for the understanding of the strong nuclear force. The traditional approach of comparing observables with hydrodynamical models based on different initial conditions typically fails to isolate the effects of the initial conditions due to the sensitivity of the observables to the collective behaviour of the expanding system. Correlations of the mean transverse momentum [pT] and the anisotropic flow Fourier coefficients v_n have been shown to serve as a unique probe of the initial conditions of the heavy-ion collisions with little to no bias from final state effects.
In this talk, correlations between [pT] and v_2 or v_3 are presented as a function of centrality in Pb–Pb and Xe–Xe collisions at √sNN = 5.02 TeV and √sNN = 5.44 TeV, respectively. The observables are compared between data and hydrodynamical models using IP-Glasma or TRENTo initial conditions. The former is based on Color Glass Condensate effective theory with gluon saturation and the latter is a parameterized model with nucleons as the relevant degrees of freedom. The data is best described by models using IP-Glasma initial conditions, whereas the TRENTo based models fail to describe the data regardless of the parametriza- tion. It is argued that the nucleon width, w, plays an essential role in describing the measured correlations.

Author: NIELSEN, Emil Gorm (University of Copenhagen (DK))

Presenter: NIELSEN, Emil Gorm (University of Copenhagen (DK))

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